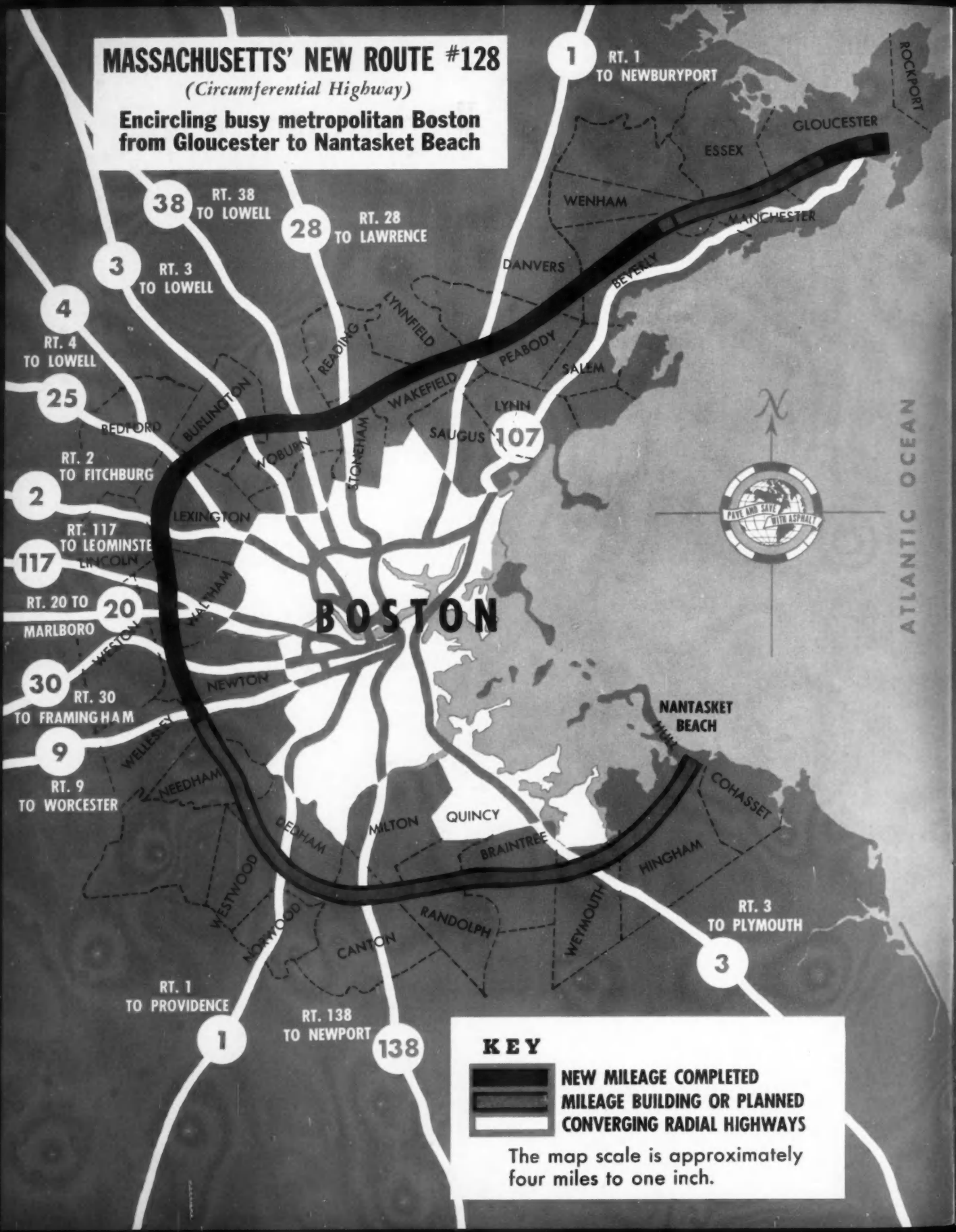
Asphalt Institute Quarterly

JANUARY 1952


MASSACHUSETTS' NEW ROUTE #128
(Circumferential Highway)
Encircling busy metropolitan Boston from Gloucester to Nantasket Beach
1
RT. 1 TO NEWBURYPORT
ROCKPORT
GLOUCESTER
ESSEX
WENHAM
MANCHESTER
38
RT. 38 TO LOWELL
28
RT. 28 TO LAWRENCE
3
RT. 3 TO LOWELL
DANVERS
BEVERLY
4
RT. 4 TO LOWELL
READING
LYNNFIELD
PEABODY
SALEM
25
REDFORD
BURLINGTON
WAKEFIELD
LYNN
WOBURN
STONEHAM
SAUGUS
107
RT. 2 TO FITCHBURG
2
LEXINGTON
RT. 117 TO LEOMINSTER
LINCOLN
117
RT. 20 TO MARLBORO
20
WALTHAM
BOSTON
WESTON
NEWTON
30
RT. 30 TO FRAMINGHAM
NANTASKET BEACH
HULL
9
WELLESLEY
RT. 9 TO WORCESTER
NEEDHAM
COHASSET
DEDHAM
MILTON
QUINCY
BRAINTREE
HINGHAM
WESTWOOD
RANDOLPH
WEYMOUTH
RT. 3 TO PLYMOUTH
3
NORWOOD
CANTON
RT. 1 TO PROVIDENCE
1
RT. 138 TO NEWPORT
138
ATLANTIC OCEAN
PAVE AND SAVE WITH ASPHALT
KEY
NEW MILEAGE COMPLETED
MILEAGE BUILDING OR PLANNED
CONVERGING RADIAL HIGHWAYS
The map scale is approximately four miles to one inch.

ASPHALT INSTITUTE Quarterly

VOL. 4, No. 1 JANUARY 1952

The Asphalt Institute Quarterly is published by the Asphalt Institute, a national, non-profit organization sponsored by members of the industry for the purpose of promoting interest in the use of asphaltic products.

The names of the Member Companies of the Institute who have made possible the publication of this magazine, are listed herein on page 15.

EDITORS

Bernard E. Gray, *President of The Asphalt Institute*
Ernest M. Bristol, *Director of Public Relations*

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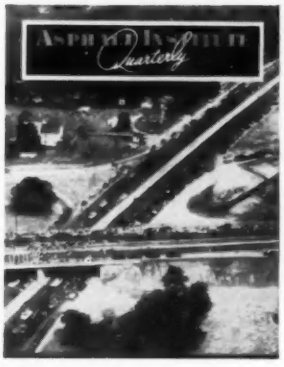


COVER

Department of Public Works of Massachusetts photo shows dedication of the new Circumferential Highway as it crosses over the Worcester Turnpike (Route 9) at Wellesley. The turnpike is a Boston radial route, while the Circumferential Highway skirts the city's congested areas and also forms an important link in the cross-state connecting system.

The map opposite shows the new route encircling Boston, with a tremendous eighty mile arc extending from Gloucester to Nantasket Beach. The central segment of the route, shown in solid black, is already in operation; the shaded northern segment is scheduled for completion in 1952; and the shaded southern section is awaiting highway construction funds.

EDITORIAL

"Out of the Muddle," is a phrase now being used as descriptive of the need for very extensive highway improvement. It is in contrast with the slogan "Out of the Mud," so widely used in the twenties, and which so aptly portrayed the needs of that period. While even yet there are many roads that are unimproved, they carry but a few vehicles a day, and the present pressing need undoubtedly is to further improve the previously "improved" roads in order that they become adequate for present-day traffic. The way in which this is attempted will have a profound effect not only upon the pocketbook of the highway user, but also on the rate at which the modernization program will be achieved. There is required concerted, intelligent understanding of what is involved, and the united efforts of all to the end that necessary corrective legislation is obtained, as well as the appropriate engineering designs.

First it is desirable to measure the scope of the problem. Some persons believe that all roads are inadequate. Such is not the case. One recent comment indicated belief that because less than one percent of all highway mileage was of a dual type this fact measured the extent of the deficiency. Actually if dual highways were present in the right places to the extent of one percent, this would mean some 33,000 miles, just about the total required. Many apparent bottlenecks exist only because of worse ones nearby. Once one is corrected the others may disappear. A two lane highway 24 feet wide, with reasonable sight distance can carry safely about 4,000 vehicles per day. Only about one percent of the highway mileage carries traffic in excess of this amount. The trouble, however, is that the two lane highways are not all 24 feet wide. In fact some fifty percent are not over 20 feet in width, and this simply does not provide enough room for safe passing, at present day speeds, of the cars and trucks that now range up to 8 feet in width, as contrasted with the much lesser widths of earlier years.

There are, therefore, two distinct types of improvement required, one the widening of several hundred thousand miles of existing pavements and the other, reconstruction, in some cases even complete replacement, of a smaller mileage where four or more lanes are required to cope with the traffic volume. However, the ability of a highway to carry traffic is related not only to width but also to the interference from cross traffic. This comes not only from intersections at grade with other roads, but also from uncontrolled real estate development. In view of the apparent trend of population to concentration in towns and cities, it is of the greatest importance that dual highways be planned both as expressways and freeways with access provided only at properly controlled points. One only needs to view the harmful encroachments upon the multi-lane highways already built adjacent to some of the larger cities to appreciate the needs in this regard, and to realize that what is *country* today will be *city* tomorrow.

The changing times are a challenge to the ingenuity of the highway engineer. Properly he should build beauty as well as mere utility into the highways of the future. Thus there is landscaping as a present part of design, while structures are representative of grace as well as strength. Numerous examples of these improved procedures are to be seen throughout the country, and this issue of the Quarterly portrays three such outstanding projects, each designed to relieve a serious traffic "muddle" in its respective area.

Route 128 passes under Route 20 at Stony Brook, Waltham. —*Photo Courtesy Massachusetts Department of Public Works*

BOSTON'S CIRCUMFERENTIAL ROUTE IS PAVED WITH ASPHALT

By Edward M. Howard, District Engineer, The Asphalt Institute

Linking together the busy radial routes that converge like the spokes of a wheel into the "Hub" at Boston, Massachusetts' new, asphalt-paved, circumferential highway, Route 128, is successfully solving a type of congestion problem that has been plaguing highway departments throughout the United States. Concentrations of population in metropolitan areas have been responsible for more and more intolerable traffic delays outside of cities and threatening paralysis of all transportation within.

Boston and Massachusetts have not been immune to this dilemma, as anyone who has tried to travel through metropolitan Boston can verify. The engineers of the Commonwealth Department of Public Works have been fully aware of all the difficulties and given careful study to each phase of each particular problem in great detail. As a result of their deliberations, and expedited by a one hundred million dollar bond issue authorized in 1949, an overall metropolitan Boston improvement plan was formulated, adopted, and is well on its way to becoming a reality.

This plan is far-reaching in its effects and, though progress has been rapid, will require several years of construction to bring to completion. It includes such important projects, already completed or in process of construction, as the new Mystic River double-decked bridge; the Central Artery — an elevated highway through downtown Boston; the James J. Storrow Memorial Drive along the Charles River; connections or accesses to these improvements; and Route 128, the "circumferential" highway planned to extend in a tremendous arc eighty miles from Gloucester to Hull to facilitate easy flow of traffic *around metropolitan Boston.*

OPENING OF ROUTE

On August 23, 1951, a 22½-mile section of the "Northern Circumferential Highway," designated as Massachusetts State Route 128, was dedicated and officially opened to public travel. This newest section follows a location which has a radius of approximately eleven miles from the heart of the city and connects the Worcester Turnpike (Route 9) with the westerly section of the previously constructed circumferential highway near Lynnfield.

By this route it is already possible to by-pass Boston from north to south without going through any heavily congested areas. Also, it forms one of five links connecting the Wilbur Cross Highway in Connecticut with the New Hampshire

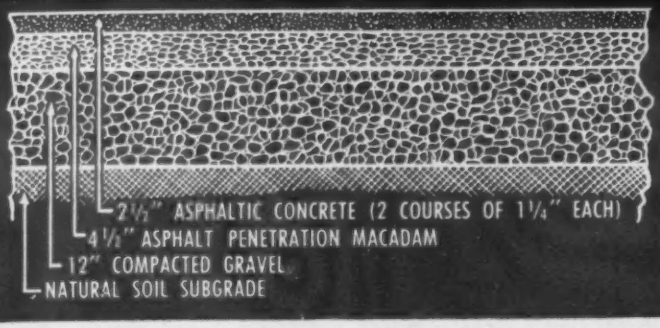


FIGURE I. TYPICAL CROSS-SECTION — MASSACHUSETTS' NEW NO. 128

Toll Road. Motorists bound for northeastern New England from the New York-New Jersey area can now proceed from the Wilbur Cross Highway, via the new dual-laned Route 15 to U. S. Route 20, thence via Route 20 to the Worcester Turnpike (Route 9), thence via Route 9 to the Circumferential Highway (Route 128), thence via Route 128 to the Newburyport-Turnpike (U. S. Route 1), thence via U. S. Route 1 to the New Hampshire Toll Road, the Maine Turnpike, and points north.

PHYSICAL FEATURES

The construction of the new Route 128 was the first under the one hundred million dollar bond issue in answer to public appeal for modern, fast and safe highways. It is designed and constructed to meet the needs of today and of years to come; a highway that is wider, with sturdier roadbed, the highest type of pavement, strong bridges and culverts; complete in design and modern construction; incorporating every up-to-date feature for the rapid and safe transport of traffic.

This new four-lane, divided expressway, beautifully landscaped and with limited access, is eighty-eight feet wide, including shoulders and median strip. It does not have a single intersection at grade nor a single traffic light. The two travelled ways, each twenty-four feet wide, are paved with asphaltic-concrete while the outside shoulders, ten feet wide, are of asphalt penetration macadam, as are all acceleration lanes, deceleration lanes and accesses. There are forty-six bridges along the highway, including overheads and underpasses. The twenty-foot median strip is depressed except at overheads and underpasses, where it is raised. The transition from depressed median to raised median is so well accomplished as to be almost unnoticeable.

A typical cross-section of the roadway structure, Figure 1, shows a natural soil subgrade supporting a foundation course of twelve inches of compacted gravel extending to the backslope of shoulder in fill sections and eleven feet beyond the edge of pavement in cut sections. Upon this foundation is four and one-half inches of asphalt penetration macadam, which is surfaced with two and one-half inches of asphaltic-concrete, placed in two courses of one and one-quarter inches each.

The asphalt penetration macadam shoulder three inches in depth is supported by twelve inches of compacted gravel on natural soil subgrade. Table I shows the gradation of macadam aggregate, keystone, and sealstone used with 85-100 penetration asphalt cement for all penetration macadam construction (see page 6).

Continued on page 6

View of new highway from Route #4425 (overhead) near Lexington. *Photo: Howard*

North from Weston, entering Waltham. *Photo: Courtesy Massachusetts Department of Public Works*

Near Worcester Turnpike. Median strip raised near overpasses and underpasses. *Photo: Howard*

From Reading northeast to Wakefield.

North from intersection with Route 30 at Newton.
Photos: Howard

AMOUNT OF TRAFFIC

The preliminary estimate of traffic over the new route was twelve thousand to fifteen thousand vehicles daily, with twenty thousand to twenty-five thousand on Sundays and holidays. The electric eye, however, is already recording a week-day average of twenty-five thousand with the Friday-Saturday-Sunday travel running over thirty thousand per day. The peak Sunday load has reached thirty-eight thousand two hundred and forty-four — all impressive evidence of the success of Massachusetts' longest, limited-access, highway construction project.

TABLE I

CRUSHED STONE shall be uniformly graded according to the requirements for 2-inch stone as follows:

SIZE OF SIEVE	PERCENT (BY WEIGHT) PASSING MINIMUM	MAXIMUM
2¼ inch	100	
2	90	100
1½	30	55*
1¼	0	15
1	0	5

*The maximum passing of 1½ inch sieve shall be decreased to 45% when the average percentage of wear of the stone (as determined by the Los Angeles Abrasion Test) is more than 17.

KEYSTONE OR CHOKESTONE for filling voids shall be uniformly graded according to the requirements of ⅝ inch stone as follows:

SIZE OF SIEVE	MINIMUM	MAXIMUM
¾ inch	100	
⅝	90	100
½	40	70
⅜	0	15
#4	0	5

PEASTONE for filling voids and for cover shall be uniformly graded according to the requirements for ½ inch stone as follows:

SIZE OF SIEVE	MINIMUM	MAXIMUM
½ inch	100	
⅜	30	60
#4	0	15
#8	0	5

TABLE II

Indicates a typical gradation of mix for the asphaltic concrete in which 85-100 Pen. asphalt cement is used.

Passing	Retained	Typical Binder Course	Typical Surface Course
1"	¾"	5.8	
¾"	½"	40.4	
½"	#4	30.3	33.6
#4	#10	2.6	25.2
#10		20.9	41.2
#10	#20	3.5	9.2
#20	#40	4.4	8.7
#40	#80	5.5	10.5
#80	#200	5.0	8.6
#200		2.5	4.2
% Bitumen		4.0	6.6

TABLE III

This tabulation of major quantities gives a condensed idea of the size of this important highway development.

ROUTE 128 STATISTICS — 22½ MILE SECTION

Cubic Yards Earth Excavation	2,807,500
Cubic Yards Ordinary Borrow	3,149,000
Cubic Yards Class A Rock Excavation	782,600
Cubic Yards Peat Excavation	833,000
Cubic Yards Gravel Borrow	1,101,000
Cubic Yards Concrete	139,500
Tons of Bituminous Concrete	105,670
Lbs. of Steel Reinforcement	10,311,000
Lbs. of Structural Steel	13,191,500
Sq. Yds. of Seeding & Mulching	2,175,000
Gallons of Bitumen	3,379,900

OKLAHOMA TURNPIKE AUTHORITY FOR TURNER TURNPIKE SELECTS ASPHALT

By Hugh A. Wallace, Division Engineer, The Asphalt Institute

The 88-mile Turnpike extending from a point near Oklahoma City to Tulsa is officially designated as the Turner Turnpike in honor of former Governor Roy J. Turner under whose administration the Oklahoma Turnpike Authority was created.

PAVING CONTRACTS AWARDED

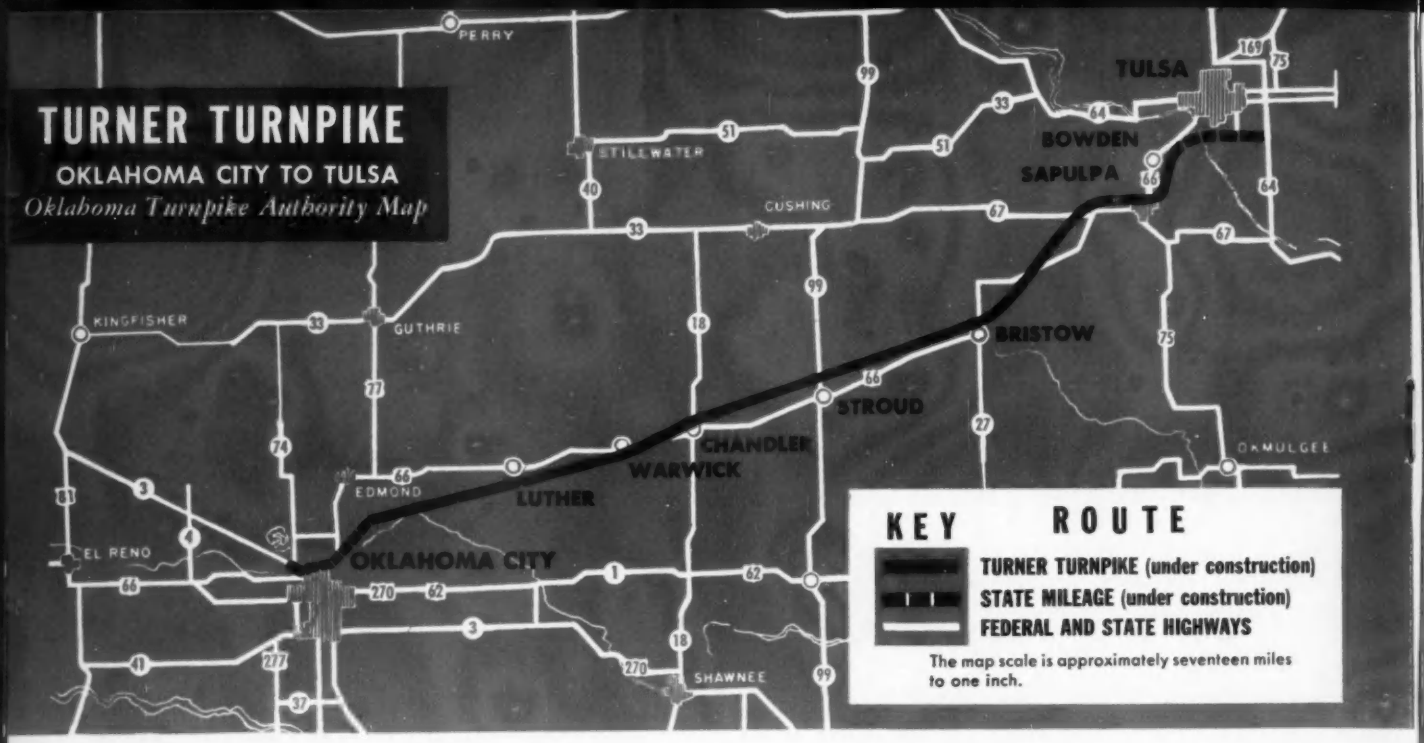
Paving contracts have been awarded on 82.6 miles of the Turnpike for construction in accordance with the design shown on pages 8 and 9 following. In July, 1951, DeLeuw, Cather & Co., Consulting Engineers, submitted to the Oklahoma Turnpike Authority five alternate paving designs, two of which were for a rigid type and three types of flexible pavement. The five alternates were approved by the Authority and five sections 27.47 miles in length were advertised for paving bids on October 30, 1951. The second letting was held on November 20, 1951 for four sections having a total length of 28.42 miles and the third letting involving three sections 26.69 miles in length was held December 18, 1951.

Bids were received on all alternates at each letting, with the low bid in each instance being on Alternate No. 3 (Asphalt). After each letting contracts were awarded to the low bidders. Paving bid proposals were divided into six parts or groups of bid items. The first being the Main Bid which included the soil-asphalt shoulders and median strip and all incidentals thereto which are common to each of the five alternate types of pavement. The other five parts of the bid proposals were the five paving alternates which contained bid items pertaining to the roadway pavement only. The lowest bids received on the rigid type of pavement were on Alternate No. 1. *Continued on page 8*

COMPETITIVE BID PRICES BY CONTRACT SECTIONS
THE TURNER TURNPIKE—OKLAHOMA CITY TO TULSA
(Awards by the Oklahoma Turnpike Authority)

CONTRACT NUMBER	MILES	ASPHALT*	P.C. CONCRETE**	ASPHALT SAVING
#34	4.53	$ 491,636.	$549,165.	$ 57,529.
#39	5.93	615,131.	711,372.	96,241.
#40 (A&B)	7.98	941,343.	1,035,413.	94,070.
#41	5.65	608,269.	707,814.	99,545.
#42	3.38	351,115.	409,213.	58,098.
#31	7.83	883,098.	988,643.	105,545.
#32	8.04	902,231.	1,014,258.	112,027.
#37	4.94	548,641.	616,204.	67,563.
#38	7.61	848,181.	959,137.	110,956.
#17	9.03	957,213.	1,094,103.	136,890.
#18 (A&B)	9.05	1,097,599.	1,229,578.	131,979.
#33 (A&B)	8.61	1,046,907.	1,137,584.	90,677.
TOTAL	82.58	$9,291,364.	$10,452,484.	$1,161,120.

**Main Bid, plus Alternate #3 (Asphalt)*
***Main Bid, plus Alternate #1 (P.C.C.)*



The Turner Turnpike is designed for an axle load of 28,800 lbs., having a roadway structure composed of (1) a compacted subgrade, (2) 12″ subbase of Special Subgrade Material, (3) 7″ of Stabilized Aggregate Base Course and (4) 5″ of hot-mix asphaltic concrete pavement. Figure 1 (Page 9) is a typical half section of roadway and shoulder.

ASPHALTIC CONCRETE PAVEMENT

The 5″ hot-mix asphaltic concrete pavement consists of a 3″ binder course of Type A mix and a 2″ surface course of Type B mix. The design of these mixes provides for a Hveem stability of not less than 35 and a density of not less than 94% or more than 98%.

Before placing the binder course, the Stabilized Aggregate Base Course is to be primed with 0.2 gal. to 0.35 gal. MC-1 cutback asphalt. (Oklahoma MC-1 grade of cutback asphalt is very similar to The Asphalt Institute MC-0 grade of material.)

Gradation limits of Types A & B asphaltic concrete mixtures are as follows:

GRADING LIMITS

	Type A	Type B
Passing 1½″ sieve	100	
" 1″ "	90 — 100	
" ¾″ "	—	100
" ½″ "	65 — 80	90 — 100
" No. 4 "	40 — 55	55 — 80
" No. 10 "	30 — 45	40 — 55
" No. 40 "	20 — 30	20 — 37
" No. 80 "	10 — 20	10 — 25
" No. 200 "	3 — 7	4 — 8
Asphalt Content (85-100 pen)	4.5 — 6.5	5.0 — 7.0

The coarse aggregate of each Type shall have a Los Angeles Abrasion of not more than 40.

SHOULDERS

The outside shoulders are to be 12′ in width and will be constructed of 6″ soil asphalt with a single asphalt surface treatment 10′ wide. The grading contracts provide for the placement of sufficient soil for the soil-asphalt shoulders and median strip by putting in place 16½″ of Special Subgrade Material. The upper 4½″ of this material will be bladed out by the paving contractor to form the shoulder and median strip.

Plans provide for close control of the soil-asphalt shoulder to be stabilized with MC-2, MC-3 or MC-4 cutback asphalt. The grade of cutback asphalt to be used for shoulder stabilization is optional with the contractor.

SUBGRADE

The grading contracts provide that all earthwork to an elevation within six inches of the finished subgrade line be compacted to 90% of Standard Proctor Density and that the upper six inches of the subgrade be compacted to 95% density. All soils encountered that are suitable for "Special Subgrade Material" are manipulated so that they are placed on top of the finished subgrade.

SPECIAL SUBGRADE MATERIAL

Special Subgrade specified for use on The Turner Turnpike is what is generally called a "subbase." Specifications for the Special Subgrade Material provide for a soil having a California Bearing Ratio of 10 or more and a Plasticity Index of less than 9. Non-plastic soils, crushed sandstone, or other crushed stone may be modified by blending with 20 to 40 percent of soils having a Plasticity Index greater than 8 and less than 15. All Special Subgrade Material must pass a 2″ sieve.

The item of Special Subgrade Material was included in the grading contracts and placed in a uniform 16½″ thick-

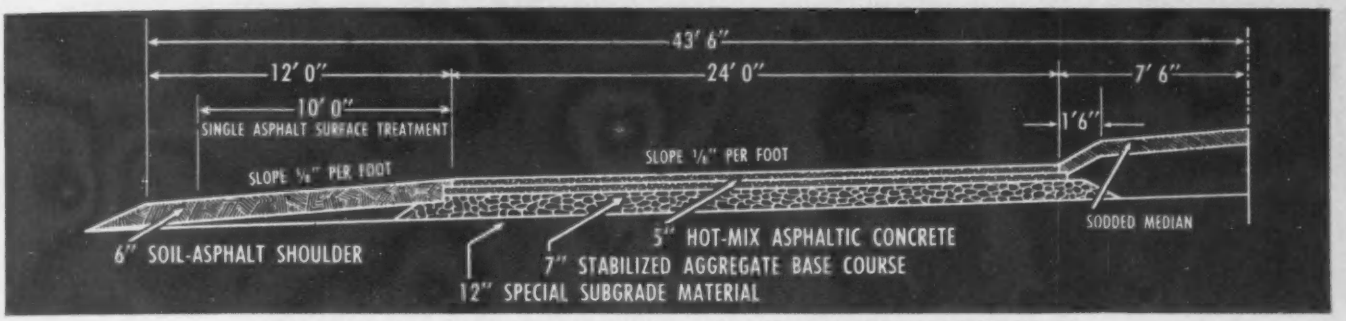


FIGURE I. TYPICAL HALF ROADWAY SECTION — TURNER TURNPIKE (ALTERNATE NO. 3)

ness. This thickness is 4½" in excess of that required for the subbase, but in as much as it was a material of the quality desired for the 15' median strip and 12' soil-asphalt shoulders, it was believed to be most economical to include the extra material in the grading contracts rather than in the paving contracts.

Soil profiles were prepared and wherever soils were encountered that would meet the specifications for Special Subgrade Material, they were manipulated in a manner resulting in their placement in the proper position of the roadway structure. In some areas it was necessary to resort to special borrow to obtain satisfactory material, while in some instances only a portion of the material was borrowed for blending with "in-place" soils.

Detailed soil studies by the engineers and the appropriate use of local soils encountered has proven to be an economical procedure. When the engineers first announced their plan of selecting soils for the 12" subbase, a paving materials controversy started, some claiming that the proposed thickness was 6" more than that necessary and, too, would cost an extra million to one and one-half million dollars. Actually, on the first 78.84 miles of grading work placed under contract, the additional 6" of Special Subgrade Material cost $14,593.01 less than an equal amount of regular or common borrow would have cost.

STABILIZED AGGREGATE BASE COURSE

The Stabilized Aggregate Base Course consists of a blend of coarse aggregate, sand, stone dust, or other inert finely divided mineral matter and soil binder. Of the material retained on the No. 4 sieve, not less than 40% shall be crushed. When tested by the Los Angeles Abrasion Method, the coarse aggregate shall have a wear of not more than 50. Specifications provide for three types of gradations of base course.

Sieve Size	Type A 1" Max.	Type B 2" Max.	Type C 3" Max.
	Percent Passing		
3"			100
2"		100	65-100
1½"		70-100	—
1"	100	55–85	45–75
¾"	70-100	50–80	—
⅜"	50–80	40–70	30–60
No. 4	35–65	30–60	25–50
No. 10	25–50	20–50	20–40
No. 40	15–30	10–30	10–25
No. 200	5–15	5–15	5–10

The Material passing the No. 200 sieve shall not be greater than ⅔ of the Material passing the No. 40 sieve.

The minus 40 mesh material of all types shall not have a Plasticity Index of more than 8 and a Liquid Limit of not more than 28.

Compaction requirements provide for a minimum Standard Proctor Density of 95%.

END

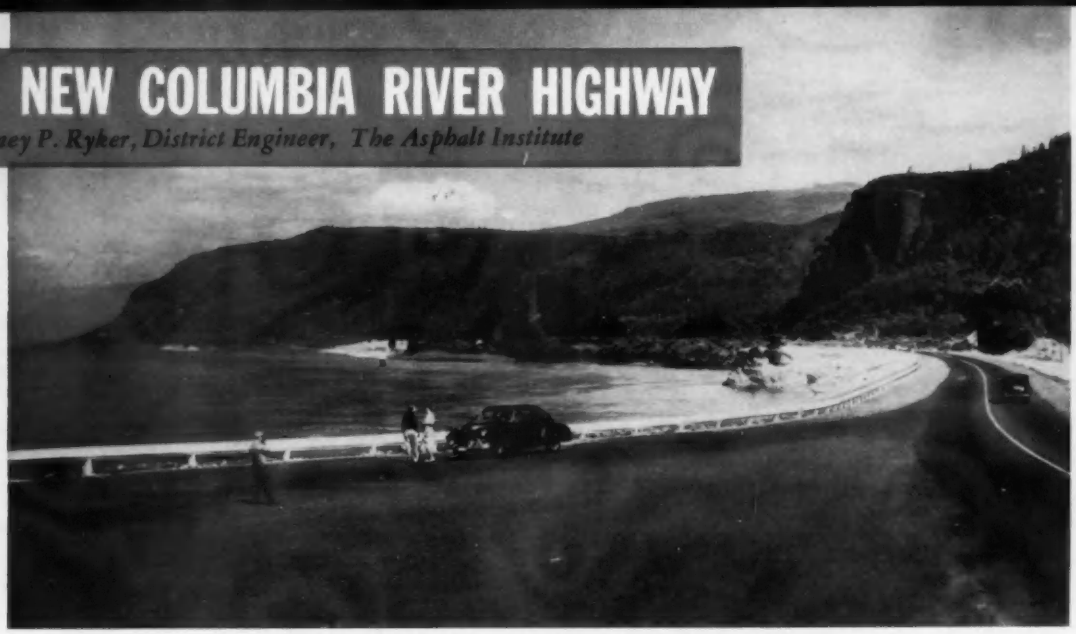
Grading operations just East of Oklahoma City Terminus.

Completed grading between Sapulpa and Tulsa.

Photos: Courtesy Oklahoma Turnpike Authority

OREGON'S NEW COLUMBIA RIVER HIGHWAY

By Rodney P. Ryker, District Engineer, The Asphalt Institute



A view up the Columbia River, showing a portion of one of the many large parking areas at points of exceptional interest on the new highway.

The original Columbia River Highway was the first major highway project in the Northwest to be constructed with asphalt pavement. Now thirty-six years old, it is still giving excellent service for motorists viewing the scenic beauties of Oregon. A typical cross-section of this long-wearing pavement is shown in Figure 3 on page 12.

PROGRESS ON A WATER-GRADE ROUTE

This old highway, with steep grades and many scenic curves, however, while a "show-window" of the state, was of course not designed for fast-moving traffic. As commercial needs developed, as early as 1938, Oregon began constructing a new Columbia River Highway at water-level along the shore. This, including the "T. H. Banfield Expressway" is now designed to extend eighty miles from Portland to The Dalles.

The first section of this route, extending from Troutdale to Dodson, was completed in 1949. The road-bed on this unit was constructed principally of materials dredged from the river-bed.

ASPHALT DESIGN

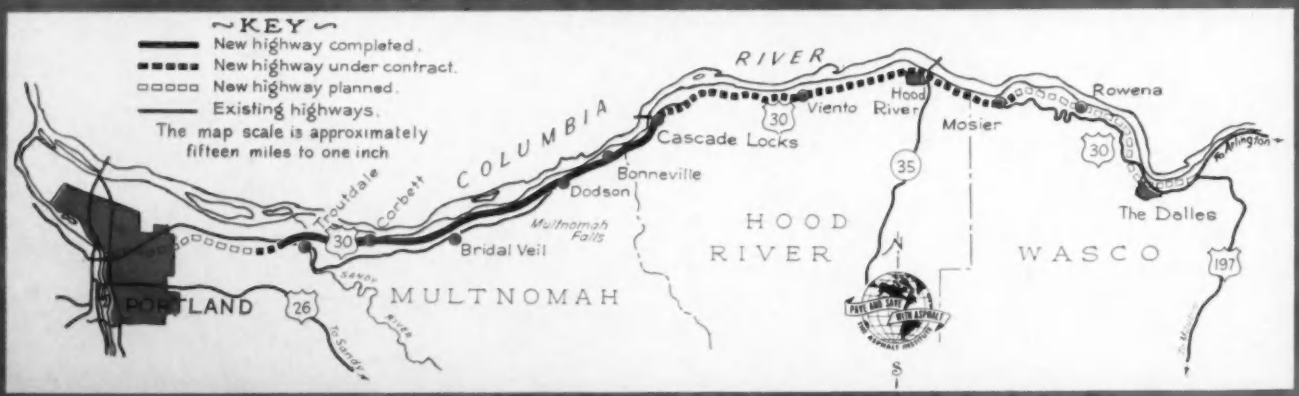
A typical cross-section of the pavement structure for this unit, Figure 1 on page 11, shows a base, which was constructed the full width of the roadway, consisting of twelve inches of compacted crushed rock for the bottom base course and two inches of compacted crushed rock for the top (levelling) base course. This is surfaced with three inches of asphalt macadam, Oregon State Highway Commission Type B-11. The roadway width of twenty-four feet is widened to forty-three feet by nine and one-half foot rock shoulders.

Two additional sections extending eastward to Bonneville and then on to Cascade Locks are now completed and in service, both closely comparable to the foregoing in pavement and roadway design. From Troutdale to Cascade Locks the shortened new route totals 26.3 miles, a reduction of 4.2 miles as compared with the old highway.

The Cascade Locks to Mosier section of the new highway, now under construction, will total 26.7 miles, as compared

Photos: Courtesy Oregon State Highway Commission

COLUMBIA RIVER HIGHWAY IN NORTHERN OREGON



The tunnel at Tooth Rock. Above, the old highway, with one of its many curved half bridges, crosses over the new road through a rock cut.

The new Columbia River Highway, with the famous Vista House in the background. Sections of the old highway are visible winding around Vista Point high up on the rock bluff.

with the present 28.3, a further reduction of 1.6 miles. Completion to The Dalles will add a 13.6 mile section, a further saving of 3.7 miles as compared with the existing location.

CASCADE LOCKS TO MOSIER

A typical cross-section of the roadway of the mileage from Cascade Locks to Mosier, Figure 2 at right, shows a base, to be constructed the full width of the roadway, consisting of thirteen inches of compacted crushed rock for the bottom base course and one and one-half inches of compacted crushed rock for the top (levelling) base course. This is surfaced with three and one-half inches of asphaltic concrete, placed in two courses — a two-inch base surfaced with a one and one-half inch wearing course. The roadway width of twenty-four feet is widened to forty-four feet by ten-foot rock shoulders.

SCENIC BEAUTY

The very beautiful views of both the old and new Columbia River Highways, made available for this issue through the courtesy of the Oregon State Highway Commission, merit more than the brief captions shown. The new highway, as pictured at the top of page 10 still retains the world-famed scenic beauty of the old, as it runs along the mighty river, past high waterfalls, precipitous cliffs and forested slopes.

The picture above, at left, shows the new highway as it tunnels its way through Tooth Rock, near Bonneville Dam, just above a railroad tunnel. The old highway route is shown with its guard rails, passing between two rocks, bordered with trees. Lewis and Clark, pioneer explorers of the Far West, came this way in 1805, down the river to Astoria.

Above at right, the new sea-level route is pictured as it passes far below the Vista House. Along the cliff the old highway winds past, including in its nearby scenic miles eleven major waterfalls and eight state parks.

The pictures on page 12 feature the narrow, but extremely beautiful old highway. The first shows the new highway also, along the river and illustrates how well scenic views have been retained at the water-level in the course of eliminating in all 20,950 degrees of curvature. In the background is Beacon Rock on the Washington side of the river.

OREGON'S ROAD SYSTEM

Including both rural roads and city streets, the road system of Oregon totals 57,658 miles, of which 7,313 are on the state highway system and 50,345 classified as roads other than state highways. Improvements on the state system include 6,363 miles of pavement, 503 miles rock surfaced, 186 miles graded only and 261 miles with partial or no improvement. There are 3,892 miles on this system that are eligible for primary and 3,122 for secondary Federal Aid Funds. Improved pavement mileage is predominantly Asphalt.

Continued on page 12

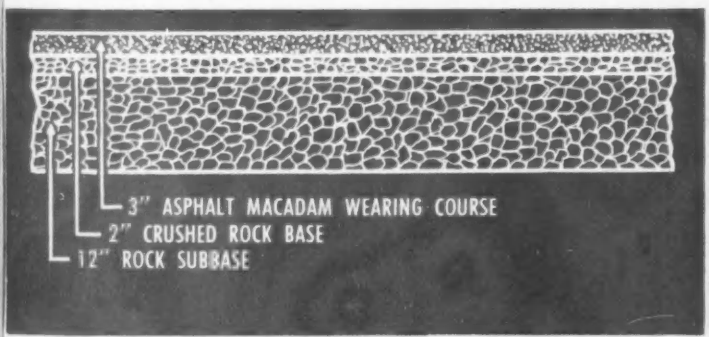


FIGURE 1. TYPICAL CROSS-SECTION — TROUTDALE TO CASCADE LOCKS

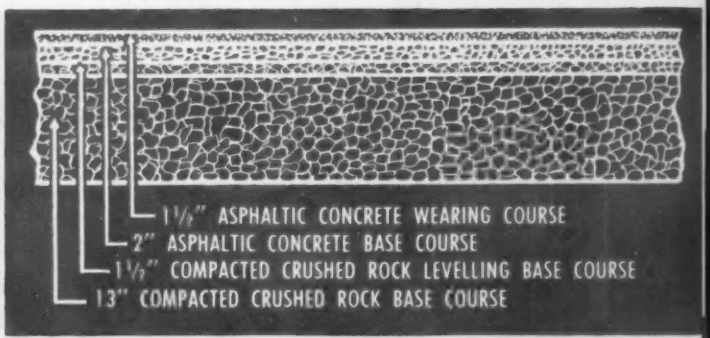

1½" ASPHALTIC CONCRETE WEARING COURSE
2" ASPHALTIC CONCRETE BASE COURSE
1½" COMPACTED CRUSHED ROCK LEVELLING BASE COURSE
13" COMPACTED CRUSHED ROCK BASE COURSE

FIGURE 2. TYPICAL CROSS-SECTION — CASCADE LOCKS TO MOSIER

The old highway in the foreground. Below to the left the new highway at water grade parallels the Columbia River. The narrow roadway on the old road lacked shoulders, but occasional turnouts were provided.

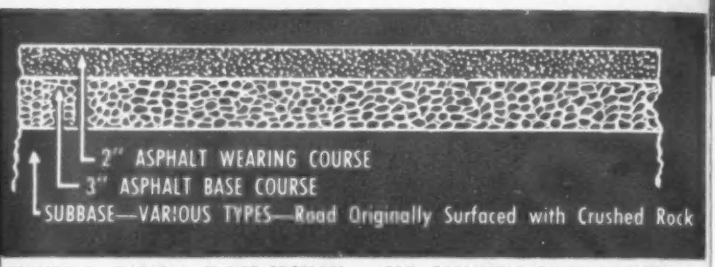


FIGURE 3. TYPICAL CROSS-SECTION — OLD COLUMBIA RIVER HIGHWAY

HISTORICAL BACKGROUND

On the old Columbia River Highway one of the first sections was a mile of asphalt pavement, ten feet in width, built in 1916 for Hood River County at the expense of Simon Benson, a Portland philanthropist. More recently the old roadway has continued comparatively narrow, with a pavement width of eighteen feet and no shoulders for much of the distance between Troutdale and the vicinity of Hood River; with a pavement width of only sixteen feet with varying shoulder widths from Hood River to The Dalles.

ROADWAY DESIGN

A typical asphalt roadway design of the old highway, Figure 3, was a five-inch pavement consisting of three-inch bituminous base with no particular attention paid to base design and a two-inch wearing surface of bituminous concrete with a three-inch crown. This crown was subsequently reduced by maintenance operations to eliminate the traffic hazard it created. A sixteen-foot roadway with two-foot shoulders was typical of the original highway.

EARLY CONSTRUCTION PROGRAM

The over-all construction program began about 1916, with paving work following as surfacing was completed. One of the first large paving projects, 22.11 miles in length, from Cascade Locks to Hood River, was opened for traffic in 1920. The cost of the Standard Bituminous Pavement, Type E, on this project was $1.36 per square yard. Two subsequent projects, Mosier to The Dalles, 122,480 square yards cost $2.50 per square yard; Hood River to Rowena, 103,146 square yards, cost $2.75 per square yard. These two projects were both five-inch pavement consisting of a three-inch base course and two-inch top wearing course. A "continuous pavement" from The Dalles to Astoria was completed in 1922.

LOCAL FINANCING

The pioneer spirit of independence of the people of the area is indicated by the following excerpt from the 1917-18 Report of the Oregon State Highway Commission:

"Although the assessed valuation of Multnomah County is more than 35% of the total assessed valuation of the entire State, this County has renounced all claim to any share of the State Funds available for road purposes, and will construct and maintain, in a high state of improvement, at its own expense, all State Roads within its boundaries."

During this 1917-18 period, the report indicates that local people of Multnomah County expended $1,800,000 on the Columbia River Highway construction. This method of road construction by Multnomah County held true until March, 1930, when the burdens of highway costs assumed by the County were too great to be supported by the local people.

The report continues, "The roads in Multnomah County represent some of the heaviest grading construction, some of the best improved, and some of the most scenic highways to be found anywhere in the world."

The old highway, winding around Bishop's Cap, a moss-covered gigantic block of basalt, crowned with fir and pine.

The express Columbia River Highway U.S. 30, as it parallels the river at water-level. It affords the motorist a new, fast, scenic highway up and down the Columbia gorge on the Oregon side.

—Photo Courtesy Oregon State Highway Commission

ADVANTAGES OF THE NEW HIGHWAY

The Columbia River Highway in its new location is a water-level route extending nearly sixty-seven miles from Troutdale to The Dalles. The sections completed to date, as shown on the map, page ten, together with the older scenic route, formerly U.S. 30, already provide a delightful two-hour loop trip from Portland and its vicinity.

The scenic beauty of these routes has been maintained but the importance of commercial needs is now being more strongly stressed. Westward from Troutdale the new "T. H. Banfield Expressway," partly under contract, will extend fourteen miles into the center of Portland. This will be a heavy-duty asphalt, four-lane, dual-type highway of two twenty-four foot roadways, separated by a median strip not less than six feet wide. The pavement on this expressway is to be three and one-half inches of asphaltic concrete, in two courses, with an eight and one-half inch crushed rock base over selected sub-base material. Within the city a curbed roadway will be used, while throughout the outer area there will be ten-foot rock shoulders. The estimated cost of this fourteen mile section is ten million dollars.

With the completion of the sections from Cascade Locks to The Dalles the State of Oregon will have secured many remarkable economic advantages from this new route construction along the Columbia River. Some of these are tabulated below so that the remarkable extent of savings involved may be checked at a glance. Briefly, the table shows a 76.1 mile route cut down by 9.5 miles to 66.6; a mountainous grade route levelled 6,700 feet in all, and curvature reductions of 20,950 degrees — the latter equivalent to more than 58 complete circles.

These are substantial physical engineering contributions to progress throughout a vitally important area. The Columbia River Highway and its extension east, the Old Oregon Trail, are both a part of U. S. 30, one of the nation's most important arterial highways and the main connection from the Eastern Seaboard and the Mississippi Valley to the Northwest. The new highway is already carrying commercial traffic, exceeding all estimates, in serving the John Day Valley, eastern Oregon, eastern Washington and Idaho.

Toward the south the new sea-level route will make more readily accessible, via The Dalles-California Highway, the water-shed of the Deschutes River, one of the finest fishing streams in America. This highway parallels the majestic Cascade Range for four hundred miles, affording some of the finest views of snow-capped mountain peaks in the United States.

To secure the commercial and scenic advantages briefly outlined above, Oregon, in its new route construction of the Columbia River Highway, is spending nearly twenty-four million dollars in estimated costs by sections, as follows:

SECTION	COST
Troutdale to Cascade Locks	$ 8,879,000
Cascade Locks to Mosier	11,083,000
Mosier to The Dalles	4,000,000
	$23,962,000

To the above total should be added the ten million dollar estimated cost of the "T. H. Banfield Expressway".

SELECTION OF PAVEMENT TYPE

In selecting the road surfacing to be used the State Highway Commission followed its practice of designing and constructing to secure maximum service at minimum cost, taking into consideration variations in traffic, climate, subsoils and the availability of materials. After meeting these conditions, the state policy is to select the pavement type that will give the lowest annual charge for the amortization of the capital investment and the maintenance of the surface. The choice for all four sections from Portland to The Dalles was Asphalt.

MILEAGE, GRADE, AND CURVATURE SAVINGS

		EXISTING HIGHWAY	NEW LOCATION	SAVINGS	
TROUTDALE TO CASCADE LOCKS					
Distance	miles	30.5	26.3	4.2	miles
Rise & Fall	feet	4,097	610	3,487	feet
Curvature	degrees	10,780	726	10,054	degrees
CASCADE LOCKS TO MOSIER					
Distance	miles	28.3	26.7	1.6	miles
Rise & Fall	feet	3,203	1,890	1,313	feet
Curvature	degrees	7,820	1,574	6,246	degrees
MOSIER TO THE DALLES					
Distance	miles	17.3	13.6	3.7	miles
Rise & Fall	feet	2,000	100	1,900	feet
Curvature	degrees	5,500	850	4,650	degrees
TOTAL TROUTDALE TO THE DALLES					
Distance	miles	76.1	66.6	9.5	miles
Rise & Fall	feet	9,300	2,600	6,700	feet
Curvature	degrees	24,100	3,150	20,950	degrees

HAROLD J. BUCK

Chairman of Executive Committee of The Asphalt Institute

Harold J. Buck is serving as Chairman of the Executive Committee of The Asphalt Institute for 1952. In accordance with Institute practice, a representative from a member company in another division will hold this office during 1953. Mr. Buck, General Sales Manager of American Liberty Oil Company at Dallas, Texas, joined that Company in 1942, following both engineering and asphalt-selling experience, the former in the Engineering Department of the City of Los Angeles and the latter with petroleum asphalt producers in the far-west, mid-west, Texas, and Oklahoma. He is a member of the Society of American Military Engineers, Association of Asphalt Paving Technologists, National Sales Executives Club, American Society Testing Materials, American Petroleum Institute and Engineers' Club of Dallas.

FACING FACTS IN 1952

By Harold J. Buck

With the drivers of more than fifty million vehicles insisting upon adequate driving facilities on our roads and streets, the Asphalt Institute, as a part of the road-building industry, looks forward to a busy year in 1952.

A critical situation has been developing. Since 1945, passenger car registrations have increased more than 50%; truck and bus totals more than 80%. Combined with these increases, the greater *mileage, width, length,* and *load* per vehicle now demand road and street carrying capacities varying from two to eight times those of only six years ago.

The foregoing shows the imperative need for road-building at a much faster rate than in the past and yet, even now with all these additional traffic requirements, of the 3,000,000 miles of highway in the U. S. approximately only 30,000 miles carry 2,000 or more vehicles per day. About 1,200,000 miles carry daily from 50 to 2,000 vehicles; the other one and three-quarter million carry less than 50. As traffic grows, we believe in stage construction improvement for the "50 to 2,000" class of roads; and for the 30,000 heavy-duty mileage recommend large-scale improvement — but not so rushed ahead as to wreck our economy with exorbitant debt.

There are wide, heavy-duty turnpikes to be built in 1952; there are hundreds of thousands of miles of the present road and street systems to be maintained, some resurfaced, undersealed, salvaged in many ways, and even reconstructed.

In all these road-building activities we of the Asphalt Institute, with steadily expanding field and research engineering facilities, plan to prove to the limit of our ability that it is always the best economy and consistent with maximum service to "Pave and Save with Asphalt."

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